IN THE CLAIMS:

1. (Original) A method for detecting a fault in a system, comprising:

obtaining a measurement for each of a plurality of variables corresponding to the operational state of the system;

ranking the variables by the reliability of the measurement for each of the plurality of variables to provide a ranked list of the variables;

selecting a first subset of the most reliable variables from the ranked list to provide a set of independent variables; and

calculating expected system dependent variables using the set of independent variables to detect the fault.

2. (Original) The method of claim 1 wherein the system is selected from the group consisting of an aircraft engine, a rocket propulsion system, and an aerospace vehicle.

3. (Original) The method of claim 1 wherein measuring the plurality of variables comprises sensing operating conditions using at least one sensor.

4. (Original) The method of claim 1 wherein the reliability of the measurement is based on the confidence of accurately obtaining the measurement for each of the plurality of variables.

5. (Original) The method of claim 1 wherein calculating expected system dependent variables comprises:

developing a model corresponding to the system; and

formulating the model to calculate the expected system dependent variables based on the set of independent variables.

6. (Original) The method of claim 1 further comprising:

selecting a second subset of variables from the ranked list to provide a set of measured dependent variables; and

comparing the expected system dependent variables to the set of measured dependent variables.

7. (Original) The method of claim 6 wherein the comparing comprises residual analysis.

8. (Original) The method of claim 5 wherein the model comprises a physical model corresponding to the system.

9. (Original) The method of claim 8 wherein the physical model comprises a model update scheme.

10. (Original) The method of claim 9 wherein the model update scheme comprises a correction factor based on data collected from operation of the system.

11. (Original) The method of claim 1 wherein at least one of the set of independent variables is measured using hardware redundancy.

12. (Original) The method of claim 11 wherein the hardware redundancy comprises measuring the at least one of the set of

independent variables using at least two hardware measuring devices.

13. (Original) The method of claim 12 wherein the measuring devices are sensors.

14. (Original) The method of claim 1 wherein the expected system dependent variables are calculated substantially only using the set of independent variables.

15. (Original) The method of claim 1 wherein the fault is an anomaly.

16. (Original) A computer-readable medium comprising a computer program for operating a computer system to detect a fault in a physical system according to the method of claim 1.

17-22. (Cancelled)

23. (Previously presented) A computer system for detecting an anomaly in a physical system, comprising:

means for providing a model of the physical system;

means for receiving a plurality of sensor measurements from the physical system, wherein at least one sensor measurement is used as an independent variable and at least one sensor measurement is used as an actual sensor measurement;

means for processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable; and

means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system.

24. (Previously presented) The computer system of claim 23, further including a plurality of sensors coupled to the physical system for providing the plurality of sensor measurements.

25. (Previously presented) The computer system of claim 24, wherein the plurality of sensors measure physical states of the physical system.

26. (Previously presented) The computer system of claim 25, wherein the plurality of sensors include redundant sensors for a physical state of the physical system.

27. (Previously presented) The computer system of claim 23, wherein the model of the physical system is given in the form of y=f(x)*n(x,t), where y is the estimated variable, x is the independent variable, t is time, f(x) is a physical response, and n(x,t) is a correction factor.

28. (Previously presented) The computer system of claim 23, wherein a residual between the estimated variable and the actual sensor measurement is determined.

29. (Previously presented) The computer system of claim 28, wherein the residual is compared to a threshold to determine the anomaly in the physical system.

30. (Previously presented) The computer system of claim 28, wherein the residual is processed through a classification procedure to determine the anomaly in the physical system.

31. (Previously presented) The computer system of claim 23, wherein the physical system is an engine.

32. (Previously presented) An apparatus for detecting an anomaly in a system, comprising:

a plurality of sensors coupled to the system for providing sensor measurements, wherein a first sensor measurement represents an independent variable and a second sensor measurement represents an actual sensor measurement; and

a computational system providing a model of the system, the computational system including,

(a) means for processing the independent variable through the model of the system to generate an estimated variable as a function of the independent variable, and

(b) means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system.

33. (Previously presented) The apparatus of claim 32, wherein the plurality of sensors measure physical states of the system.

34. (Previously presented) The apparatus of claim 33, wherein the plurality of sensors include redundant sensors for a physical state of the system.

35. (Previously presented) The apparatus of claim 32, wherein the model of the system is given in the form of y=f(x)*n(x,t), where y is the estimated variable, x is the independent variable, t is time, f(x) is a physical response, and n(x,t) is a correction factor.

36. (Previously presented) The apparatus of claim 32, wherein a residual between the estimated variable and the actual sensor measurement is determined.

37. (Previously presented) The apparatus of claim 36, wherein the residual is compared to a threshold to determine the anomaly in the system.

38. (Previously presented) The apparatus of claim 36, wherein the residual is processed through a classification procedure to determine the anomaly in the system.

39. (Previously presented) The apparatus of claim 32, wherein the system is an engine.

40. (Previously presented) A method for detecting an anomaly in a physical system, comprising:

providing a model of the physical system;

receiving a plurality of sensor measurements from the physical system, wherein a first sensor measurement is used as an independent variable and a second sensor measurement is used as an actual sensor measurement;

processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable; and

comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system.

41. (Previously presented) The method of claim 40, further including providing a plurality of sensors coupled to the physical system for providing the plurality of sensor measurements.

42. (Previously presented) The method of claim 41, wherein the plurality of sensors measure physical states of the physical system.

43. (Previously presented) The method of claim 40, wherein the model of the physical system is given in the form of $y=f(x)*n(x,t)$, where y is the estimated variable, x is the independent variable, t is time, $f(x)$ is a physical response, and $n(x,t)$ is a correction factor.

44. (Previously presented) The method of claim 40, further including determining a residual between the estimated variable and the actual sensor measurement.

45. (Previously presented) The method of claim 44, wherein the residual is compared to a threshold to determine the anomaly in the physical system.

46. (Previously presented) The method of claim 44, wherein the residual is processed through a classification procedure to determine the anomaly in the physical system.

47. (Previously presented) A system analysis tool for detecting an anomaly in a system, comprising:

a plurality of sensors coupled to the system for providing sensor measurements, wherein a first sensor measurement is used an independent variable and a second sensor measurement is used an actual sensor measurement; and

a model of the system, the model including,

(a) means for generating an estimated variable as a function of the independent variable, and

(b) means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system.

48. (Previously presented) The system analysis tool of claim 47, wherein the plurality of sensors measure physical states of the system.

49. (Previously presented) The system analysis tool of claim 48, wherein the plurality of sensors include redundant sensors for a physical state of the system.

50. (Previously presented) The system analysis tool of claim 47, wherein the model of the system is given in the form of $y=f(x)*n(x,t)$, where y is the estimated variable, x is the independent variable, t is time, f(x) is a physical response, and n(x,t) is a correction factor.

51. (Previously presented) The system analysis tool of claim 47, wherein a residual between the estimated variable and the actual sensor measurement is determined.

52. (Previously presented) The system analysis tool of claim 51, wherein the residual is compared to a threshold to determine the anomaly in the system.

53. (Previously presented) The system analysis tool of claim 51, wherein the residual is processed through a classification procedure to determine the anomaly in the system.

54. (Previously presented) The system analysis tool of claim 47, wherein the system is an engine.